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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Arvind Halliyal

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10/18/2004

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EXAMINER

BARAN, MARY C

ART UNIT

PAPER NUMBER

2857

DATE MAILED: 10/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/845,231

Applicant(s)

HALLIYAL ET AL.

Examiner

Mary Kate B Baran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 July 2004.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
4a) Of the above claim(s) 8-27 and 31-34 is/are withdrawn from consideration.
5) ☒ Claim(s) 37 is/are allowed.
6) ☒ Claim(s) 1-5, 7, 28, 29, 35 and 36 is/are rejected.
7) ☒ Claim(s) 30 is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 30 April 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. The action is responsive to the Amendment filed on 28 July 2004. Claims 1-5, 7, 28-30, and 37 are pending. Claim 6 has been cancelled. Claim 37 is new.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 28-30, 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moslehi (U.S. Patent No. 5,270,222) in view of Gevelber et al. (U.S. Patent No. 6,162,488) (hereinafter Gevelber).

Referring to claim 1, Moslehi teaches a system for controlling a thin film deposition process (see Moslehi, column 6 lines 50-60), comprising: one or more thin film deposition components operative to deposit a thin film on one or more portions of a wafer (see Moslehi, column 9 lines 22-28); a thin film deposition component driving system for driving the one or more deposition components (see Moslehi, column 9 lines 28-42); a system for directing light on to the deposited thin film and collecting light reflected from the deposited thin film (see Moslehi, column 11 lines 55-64 and Figure 9); a monitoring system adapted to detect structural irregularities associated with the deposited thin film by comparing reflected light data associated with the deposited thin

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film with a database comprising known thin film reflected light signatures (see Moslehi, column 20 lines 44-46 and column 20 line 65 – column 21 line 5); and a processor operatively coupled to the monitoring system and the thin film deposition component driving system (see Moslehi, column 6 lines 9-23). Moslehi does not teach that the processor is operatively coupled to a non-linear training system which facilitates the processor in determining deposition parameter adjustments to the one or more deposition components according to the received data.

Gevelber teaches that the processor is operatively coupled to a non-linear training system which facilitates the processor in determining deposition parameter adjustments to the one or more deposition components according to the received data (see Gevelber, column 16 lines 2-22 and column 17 lines 56-65).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Moslehi to include the teachings of Gevelber because having a non-linear system would have allowed the skilled artisan to operate the deposition system over a wide range of operating conditions (see Gevelber, column 19 lines 31-36).

Referring to claim 2, Moslehi teaches the monitoring system comprising a scatterometry system for processing the light reflected from the thin film (see Moslehi, column 10 lines 40-58).

Referring to claim 3, Moslehi teaches that structural irregularities associated with the thin film include large grains (see Moslehi, column 14 lines 58-67).

Referring to claim 4, Moslehi teaches that the processor determines the presence of an unacceptable thin film deposition condition for at least a portion of the wafer (see Moslehi, column 21 lines 2-5) according to the data received from the monitoring system (see Moslehi, column 20 lines 41-46).

Referring to claim 5, Moslehi teaches that the deposition parameter adjustments comprise at least one of thickness (see Moslehi, column 7 lines 44-49), uniformity (see Moslehi, column 7 lines 44-49), rate of deposition (see Moslehi, column 6 lines 53-60), pressure (see Moslehi, column 5 lines 56-62), flow rate of carrier gas (see Moslehi, column 5 lines 56-62) or temperature (see Moslehi, column 5 lines 56-62).

Referring to claim 28, Moslehi teaches a method for monitoring and controlling the deposition of a thin film (see Moslehi, column 6 lines 50-60), comprising: depositing a thin film on a wafer (see Moslehi, column 9 lines 22-28); directing a light onto the thin film (see Moslehi, column 10 lines 13-16); collecting a light reflected from the thin film (see Moslehi, column 11 lines 55-64 and Figure 9); employing scatterometry means to analyze the reflected light to determine one or more properties of the thin film (see Moslehi, column 10 lines 40-50); monitoring structural irregularities associated with the deposited thin film by comparing reflected light data associated with the deposited thin

film with a database comprising known thin film reflected light signatures (see Moslehi, column 20 line 65 – column 21 line 5); and controlling a deposition component to deposit thin film on the wafer (see Moslehi, column 6 lines 50-60). Moslehi does not teach utilizing a non-linear training system which facilitates determining deposition parameter adjustments according to the properties of the thin film.

Gevelber teaches utilizing a non-linear training system which facilitates determining deposition parameter adjustments according to the properties of the thin film (see Gevelber, column 16 lines 2-22 and column 17 lines 56-65).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Moslehi to include the teachings of Gevelber because having a non-linear system would have allowed the skilled artisan to operate the deposition system over a wide range of operating conditions (see Gevelber, column 19 lines 31-36).

Referring to claim 29, Moslehi teaches that the properties include at least one of thickness (see Moslehi, column 7 lines 44-49) or uniformity (see Moslehi, column 7 lines 44-49).

Referring to claims 35 and 36, Moslehi teaches regulating a process for depositing a thin film (see Moslehi, column 9 lines 22-28), comprising: using one or more deposition components to deposit a thin film (see Moslehi, column 9 lines 22-28) utilizing reflected light and comparing to known thin film reflected light signatures (see

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Moslehi, column 20 line 65 – column 21 line 5); determining the characteristics of the thing film deposition (see Moslehi, column 7 lines 37-49); and using a processor to coordinate control of the one or more deposition components to deposit the thin film (see Moslehi, column 6 lines 50-60). Moslehi does not teach a non-linear training system.

Gevelber teaches a non-linear training system (see Gevelber, column 17 lines 56-65).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Moslehi to include the teachings of Gevelber because having a non-linear system would have allowed the skilled artisan to operate the deposition system over a wide range of operating conditions (see Gevelber, column 19 lines 31-36).

3. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moslehi (U.S. Patent No. 5,270,222) and Gevelber et al. (U.S. Patent No. 6,162,488) (hereinafter Gevelber) in view of Robinson et al. (U.S. Patent No. 5,629,137) (hereinafter Robinson).

Referring to claim 7, Moslehi and Gevelber teach all the features of the claimed invention except that the processor partitions the mask into a plurality of grid blocks and makes a determination of deposition conditions at the one or more grid blocks.

Robinson teaches that the processor partitions the mask into a plurality of grid blocks and makes a determination of deposition conditions at the one or more grid blocks (see Robinson, column 11 lines 27-50).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Moslehi and Gevelber to include the teachings of Robinson because partitioning the mask and determining thickness at the grid blocks would have allowed the skilled artisan to enhance the physical robustness of reticle mask (see Robinson, column 40-44).

Allowable Subject Matter

4. Claim 30 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

5. Claim 37 is allowed.

6. The following is a statement of reasons for the indication of allowable subject matter: controlling the deposition of a thin film of a wafer based at least in part on data received from a scatterometry system, is not found, taught or suggested in the prior art of record.

Response to Arguments

7. Applicant's arguments filed 28 July 2004 have been fully considered but they are not persuasive.

Applicant argues that Moslehi does not teach "a nonlinear training system that determines thin film deposition parameter adjustments to one or more deposition components according to reflected light data associated with deposited thin film". Applicant's arguments are not well taken, as Moslehi teaches a process control computer which uses a diagnostic algorithm to performing diagnostics and prognostics for use with CVD metal layers (see Moslehi, column 20 lines 41-46). The algorithm, as shown in Moslehi, uses scattered data (see Moslehi, column 20 lines 46-65) to identify problems within the fabrication process (see Moslehi, column 20 lines 26-40). Moslehi does not specify a nonlinear training system; however, this limitation is taught by Gevelber. Gevelber teaches a control structure which uses a nonlinear predictive algorithm to control the process (see Gevelber, column 17 lines 56-65). It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Moslehi to include the teachings of Gevelber because using a nonlinear predictive technique would have allowed the skilled artisan to control the growth of a coating within a wider range (see Gevelber, column 17 lines 56-65).

Applicant further argues that Moslehi does not teach, "collecting light reflected from the deposited thin film". Applicant's arguments are not well taken. Moslehi teaches transmitting a laser beam onto a semiconductor wafer and collecting reflected data via a fiber termination (see Moslehi, column 11 lines 55-64 and Figure 9).

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary Kate B Baran whose telephone number is (571) 272-2211. The examiner can normally be reached on Monday - Friday from 9:00 am to 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S Hoff can be reached on (571) 272-2216. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

13 October 2004



PATRICK ASSOUD
PRIMARY EXAMINER